8. The process of claim 5 wherein the hydrogen content in carbon monoxide ranges from about 10 vol % to about 60 vol %.

9. The process of claim 1 wherein the iron containing article, contains less than 0.77 wt% carbon.

REMARKS

Support for amending claim 1 is found in the specification in at least paragraphs 5-8, 17, and 27 for CO/H_2 mixtures and paragraph 24 for carbon activity greater than one. Claim 5 has been amended solely to maintain antecedent basis. Support for new dependent claim 9 is found in paragraph 22 of the specification.

35 USC §103(a)

The Examiner has rejected claims 1-8 under 35 USC 103(a) over Ramanarayanan (US 5,869,195) in view of Applicant's admission of prior art and Garg (US 6,287,393).

Ramanarayanan describes sulfur modification of a pearlite layer in steels. Other than the generic carburization description cited by the Examiner, this patent does not detail pearlite formation. As the Examiner points out, Ramanarayanan does not teach (a) heating to the austenite region or (b) exposing to a supersaturated carbon environment at 727-900°C. In addition, Ramanarayanan does not teach about carbon activities greater than one.

Garg describes partial oxidation to create a special reducing gas loaded with non-carborizing components by passing at least hydrocarbons, nitrogen, and oxygen over a catalyst to form carborizing mixtures of hydrogen, carbon monoxide, nitrogen, and oxygen. Garg's main invention is the use of oxygen to minimize coking in his catalyst. See for example, Garg's claim 2 that claims using 1-5 vol% O_2. This teaching that oxygen is beneficial is opposite of the findings of the present invention wherein oxygen interferes

with the $CO + H_2 = C + H_2O$ reaction. Garg teaches that this oxygen is also necessary to have the higher 40-50% CO necessary for accelerated carburization (col. 7, l 49-59). Not only does the oxygen content teach away from the present invention, but so does the percentage of CO. Garg teaches that only >20% to <45% CO will work. However, the present invention shows that a broader range (*i.e.*, 10-60%) works well. Garg does not disclose CO/H_2 ratios or carbon activities. In fact, Garg discloses a very different carburizing environment than the as-amended claims.

Claims 1 and 3 have been amended to emphasized the CO/H_2 carburizing atmosphere and its carbon content (supersaturation) to better differentiate the present invention from the cited references. Garg does not discuss supersaturation.

Ramanarayanan describes modification of existing pearlite layers that were generally formed by heat treatment of high carbon steels. Sulfur modification of pearlite forms different grain structures than those in the pearlite alone. The different corrosion resistance of Ramanarayanan's sulfur modified pearlite makes it useful for different technical applications where corrosion is greater or caused by different chemicals. There is no reason to combine this patent with Garg.

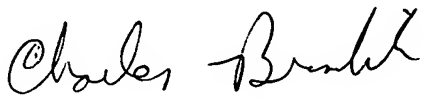
Kawato (JP 02-185960, English abstract) does not appear to describe the carburizing mixture claimed by the present invention. The temperature aspect brought up by the Examiner is but one of the several differences of the present invention. Claim 1 has been amended to better differentiate the difference of the present claims and Kawato. Claims 2 and 6 as dependent on claim 1 have also been limited. If as-amended claim 1 is non-obvious, then claims dependent on as-amended claim 1 are also non-obvious.

Kawato does not appear to disclose or suggest the specific CO/H_2 carburizing atmosphere nor its combination with other process steps claimed in the as-amended claims. Kawato discloses a wear resistant member and does not discuss corrosion. Applicants submit that at the time of the present invention, the specific process in the as-amended claims was not known or expected. Indeed, references such as Garg teach away from the present invention.

The present invention claims the best way of making pearlite layers. Even though the cited references may describe pearlite, they describe processes that are slower and/or produce lower quality pearlite layers. These references also describe different processes with different combinations of steels, carburizing atmospheres, and process conditions. Applicants respectfully suggest that the present invention claims an improved and more efficient method of making pearlite that is not taught in the cited references.

Reconsideration of the application as amended is respectfully requested.

Respectfully submitted,



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[X] Pursuant to 37 CFR 1.34(a)

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims:

Please delete claims 3 and 4.

Please add new claim 9 as follows:

Please amend claims 1 and 5 as follows:

AMENDED CLAIMS 1 AND 5

1. (amended) A process for producing pearlite from an iron containing article comprising the steps of, (a) heating an iron containing article comprising at least 50 wt % iron for a time and at a temperature sufficient to convert at least a portion of said article from a ferritic structure to an austenitic structure, (b) exposing said austenitic structure, for a time sufficient and at a temperature of about 727 to about 900°C, to a carbon supersaturated CO/H_2 environment having a carbon activity greater than about 1, to diffuse carbon into said austenitic structure and (c) cooling said iron containing article to form a continuous pearlite structure.

2. The process of claim 1 wherein said iron containing article further comprises silicon, manganese, and mixtures thereof.

3. (deleted)

4. (deleted)

5. (amended) The process of claim [4] 1 wherein [when said CO/H_2 gaseous environment is selected as said carbon supersaturated environment,] the H_2 [hydrogen contents] in CO [carbon monoxide] ranges from about 2.5 vol % to about 90 vol %.

6. The process of claim 1 wherein said time sufficient to diffuse carbon into the austenitic structure ranges from about 1 minute to about 50 hours.

7. The process of claim 6 wherein said thickness of pearlite is at least about 10 microns.

8. The process of claim 5 wherein the hydrogen content in carbon monoxide ranges from about 10 vol % to about 60 vol %.

NEW CLAIM 9

9. The process of claim 1 wherein the iron containing article, contains less than 0.77 wt% carbon.